Patent claims

1. Detector module for X-ray radiation measurement, with
   - a detector array, which has a first surface, facing a radiation source, which is provided with a number of detector elements, and a second surface, facing away from the radiation surface; and
   - a conductor track carrier which is arranged at a distance from the second surface of the detector array and is provided with conductor tracks;
   - first connections of detector elements which are located on the second surface of the detector array being connected to the conductor tracks with the help of bonding wires;
   - the bonding wires of the first connections of the detector elements being guided through bores in the conductor track carrier onto the side of the conductor track carrier facing away from the detector array, to be connected to the conductor tracks which are developed on the surface of the conductor track carrier facing away from the detector array;
   - a bore being provided in the conductor track carrier for each detector element; and
   - the conductor tracks being guided to signal-processing electronics to process the signals coming from the individual detector elements.

2. Detector module according to claim 1, in which the detector elements are integrated with amplifier electronics.

3. Detector module according to claim 1, in which the detector elements are highly sensitive drift detector cells which are monolithically integrated with field effect transistors.

4. Detector module according to one of the previous claims, in which second connections of the detector elements are connected by simple chain bonding connections at a bus structure provided on the detector array.

5. Detector module according to claim 4, in which the bus structure is provided at the external edges of the detector array and the bus lines of the bus structure are connected by bonding wires to conductor tracks developed on the conductor track carrier.

6. Detector module according to one of the previous claims, in which the detector array together with the conductor track carrier is mounted in a housing.

7. Detector module according to claim 6, in which the housing is made of a material with high thermal conductivity and low X-ray fluorescence capacity.

8. Detector module according to claim 6 or 7, in which the housing is made of graphite.

9. Detector module according to one of claims 6 to 8, in which the signal-processing electronics are also provided in the housing.

10. Detector module according to one of the previous claims, in which the signal-processing electronics are provided on a circuit support which is arranged on the side of the conductor track carrier facing away from the detector array.

11. Detector module according to one of the previous claims, in which the signal-processing electronics are screened from

the radiation source by a radiation shield.

12. Detector module according to claim 11, in which the radiation shield is provided between the conductor track carrier and the signal-processing electronics.

13. Detector module according to claim 11 or 12, in which the radiation shield has a first layer of a chemically stable material with atoms of high atomic number, such as for example tantalum or tungsten.

14. Detector module according to claim 13, in which the first layer of the radiation shield has a thickness of more than 300 μm.

15. Detector module according to claim 13 or 14, in which, at the side of the first layer of the radiation shield facing the radiation source, a second layer of a material with atoms of medium atomic number, such as for example titanium, vanadium or chromium, is provided.

16. Detector module according to claim 15, in which the second layer of the radiation shield has a thickness of more than 50 μm.

17. Detector module according to claim 15 or 16, in which, at the side of the second layer of the radiation shield facing the radiation source, a third layer of a material with atoms of low atomic number, such as for example aluminium, is provided.

18. Detector module according to one of the previous claims, in which the conductor track carrier is coupled with the circuit support by means of a flexible connection film (I).

19. Detector module according to one of the previous claims, in which the conductor track carrier is coupled with the signal-processing electronics by means of a flexible connection film (II).

20. Detector module according to one of the previous claims, which has a hexagonal or pentagonal or quadrangular shape.

21. Detector module according to one of the previous claims, in which contact between the detector array and the conductor track carrier is achieved by means of flip-chip contact.

22. Detector module according to one of the previous claims, in which an intermediate layer the dielectric constant of which is clearly less than that of the carrier material is provided between the mechanically stable carrier material of the conductor track carrier and the signal-carrying metallization plane of the conductor tracks.

23. Detector module according to claim 22, in which the intermediate layer has a thickness which corresponds to approximately the width of a signal-carrying conductor track.

24. Detector module according to claim 22 or 23 in which benzocyclobutenes or polyphenylquinoxalines are used as material for the intermediate layer.

25. Detector module according to one of claims 22 to 24 in which screening conductor tracks are provided in the metallization plan between the signal-carrying conductor tracks, and in which further screening conductor tracks are also provided at the same point in a second metallization plane between the stable carrier material of the conductor

track carrier and the dielectric intermediate layer.

26. X-ray detector system, with

- a number of detector modules according to one of claims 1 to 28;
- a frame for holding the number of detector modules on an essentially hemispherical surface around a material sample to be examined;
- the essentially hemispherical surface being formed by a capped icosahedron structure.